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AN EXHAUST AEROSOL GENERATOR FOR 1-1/2-HORSEPOWER MOTORS

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Attachments using the exhaust of gasoline motors for producing aerosols were used effectively on jeep and airplane engines for mosquito and fly control work by the American military forces during World War II. The particle size of aerosols produced by this method depends on the speed of the engine and on the rate of flow, viscosity, and other physical characteristics of the insecticide solution.

An exhaust aerosol generator has been constructed to be used on a 1-1/2 horsepower, 4-cycle gasoline motor. The cost of material and brazing, in addition to the motor, is estimated to be less than $5. The apparatus can be modified slightly for use on larger motors up to 20 horsepower. This method of producing an aerosol is economical if the motor is already on hand.

This apparatus can be used for killing flies and any other pests for which the aerosol bomb is used. The machine can be used in barns, greenhouses, warehouses, and houses, and under canopies in the field. It is not suitable for dispersing water suspensions unless small quantities are used, but most oil solutions can be used in the machine.

The carbon monoxide fumes build up with extended use of the machine in confined spaces, but for the usual time in applying insecticides the carbon monoxide is not objectionable.

A Briggs and Stratton motor has been used with the governor set for a speed of 2,500 r.p.m. The higher the speed the smaller the particle size.

To break up the insecticide solution the oil is released into the exhaust gas as the gas escapes between the 3/16-inch diameter tube for the oil and the 1/4-inch diameter hole in the pipe cap. This opening is 0.0214 square inch, which is sufficient to allow the engine to be run with a back pressure of only about 3-1/2 pounds per square inch.

The flow of oil controls the particle size, and for ordinary fly sprays the flow should be about 4 liters per hour. This flow can be easily regulated by using a small opening in the oil line. On this machine the opening is 0.035 inch in diameter. When deodorized-kerosene standard fly sprays are used, this flow rate gives an average particle diameter of about 15 microns.

The equipment required for this apparatus, in addition to the motor, is as follows: Three 1/2-inch pipe nipples - one 2-1/2 inches, one 3-1/2 inches, and one 5-1/2 inches long; two 1/2-inch pipe caps; one 1/2-inch pipe tee; a piece of 3/16-inch (o.d.) copper tubing about 3 inches long; one half-union brass coupling with a 1/2-inch tube flare at one end and a 1/8-inch pipe thread at the other end; one 1/8-inch pipe valve; two 1/8-inch pipe fittings; and a discarded aerosol bomb.

Figure 1 shows the complete assembly with the machine in operation. Figure 2 shows a close-up of the nozzle. Figure 3 shows the cross section through the nozzle.

Construction of the apparatus (fig. 1) consists in attaching the 2-1/2-inch pipe nipple (D) to the engine, the pipe tee (C) to D with the tee upward, and then the 5-1/2-inch nipple (E) to the top of C, with a pipe cap (F) on top. In a 3-1/2-inch nipple (B) a hole 1 inch from one end is bored with a 7/32-inch drill. One end of a 3-inch length of 3-1/16-inch copper tubing (H), bent as shown in figure 3, is inserted into this hole so that it protrudes slightly, and the other end extends 1 inch beyond B. In the center of pipe cap (A) is drilled a 1/4-inch diameter hole. As is further illustrated in figure 3, a half-union brass coupling (I) with a 1/2-inch tube flare to a 1/8-inch thread, is put over the end of H, with the thread at the top, and then brazed so that I is connected to H and H to the pipe B. A brass disk (not shown) perforated with a 0.035-inch diameter hole is placed on the 1/8-inch pipe fitting (K), and a valve (G) is then attached. The cap A is then tightened to the nipple B so that the tube H projects through the hole. The tube is then marked, the cap removed, and the tube cut so that it extends only to the inside edge of the 1/4-inch hole. Cap A is then replaced, completing the nozzle. With these fittings completed, B is attached to pipe tee C. The discarded aerosol bomb (J) is converted into the container by drilling a 1/2-inch diameter hole in the base for filling, and a 1/4-inch diameter hole into the tapered end, removing the tube, and brazing on a 1/8-inch pipe fitting (L). The bomb is then attached to the valve G, and the machine is ready for operation.

The motor should be run for 2 minutes to heat it up before the insecticide solution is run through. The aerosol should appear white, and in a closed room should remain air-borne for more than 30 minutes. If a bluish aerosol is produced, the machine is too hot and the warm-up time should be cut down. If the liquid drips from the nozzle excessively, the warm-up time may be too short, the motor speed too slow, the liquid flow too great, or the oil tube not centered in the 1/4-inch hole in the pipe cap A.

Similar apparatus can be used on gasoline motors of various sizes. The exhaust-outlet hole should be in proportion to the horsepower of the motor. Some recommended sizes when 3/16-inch o.d. copper tubing is used for the oil line are as follows:

Motor Horsepower	Diameter of Outlet Opening in Inches
1-1/2	0.250 (1/4)
3 - 5	.266 (17/64)
5 - 10	.297 (19/64)
10 - 15	.313 (5/16)
15 - 20	.344 (11/32)

For the larger motors the flow of oil should be increased in proportion to the horsepower. For motors larger than 1-1/2 horsepower, an ordinary valve without the use of the capillary disk is sufficient to control the oil flow. A flexible metal tubing can be used between the oil tank and the outlet opening.

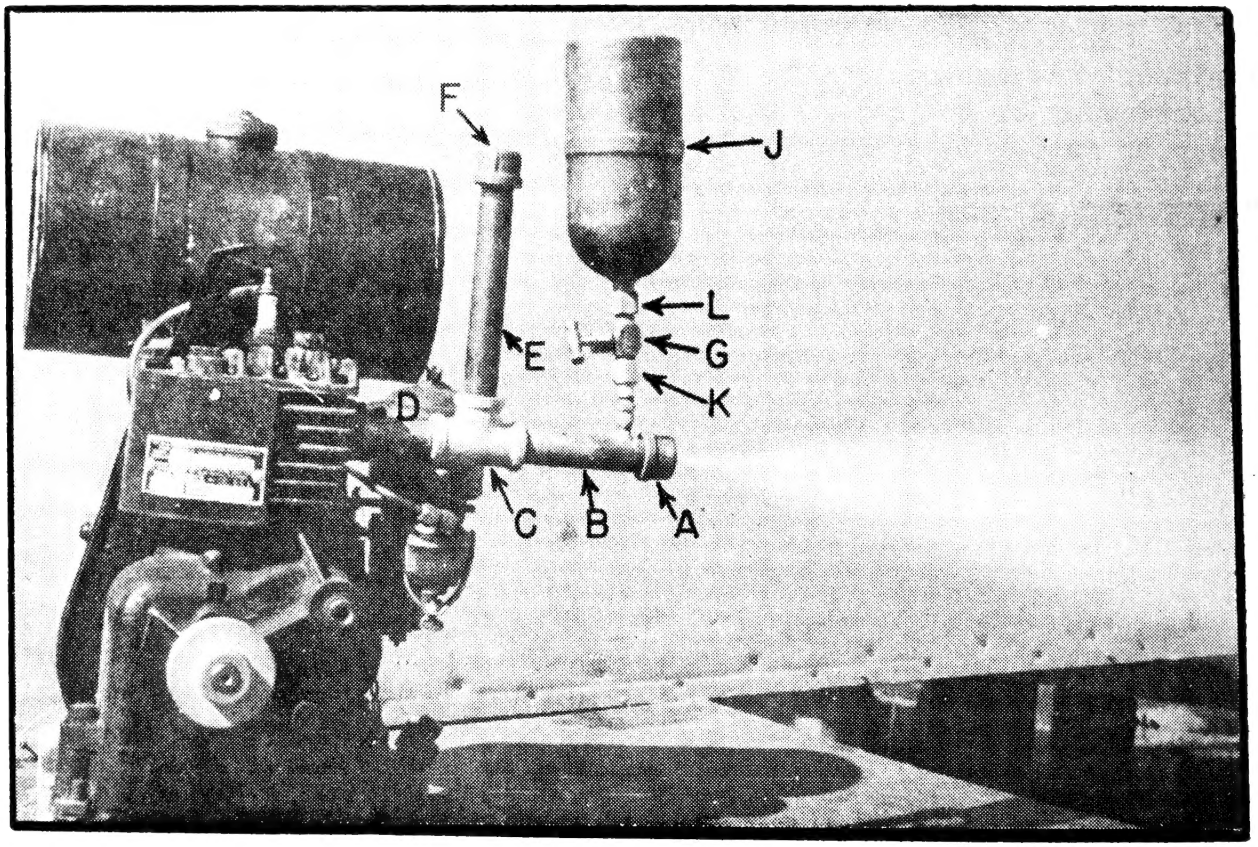

Figure 1.—Assembly of 1-1/2-horsepower gasoline-engine exhaust aerosol generator.

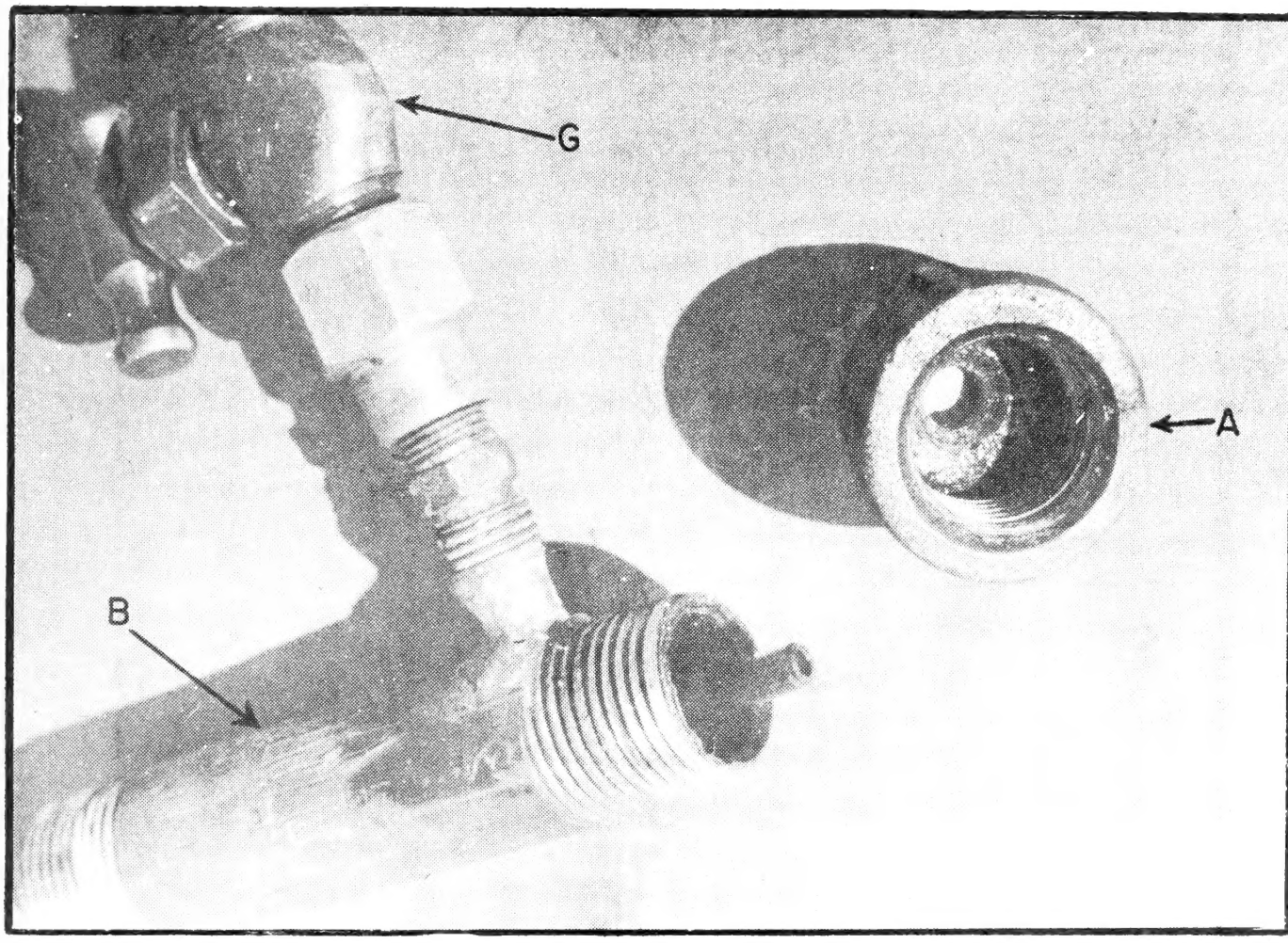

Figure 2.—Details of nozzle of exhaust aerosol generator for use with 1-1/2-horsepower gasoline motor.

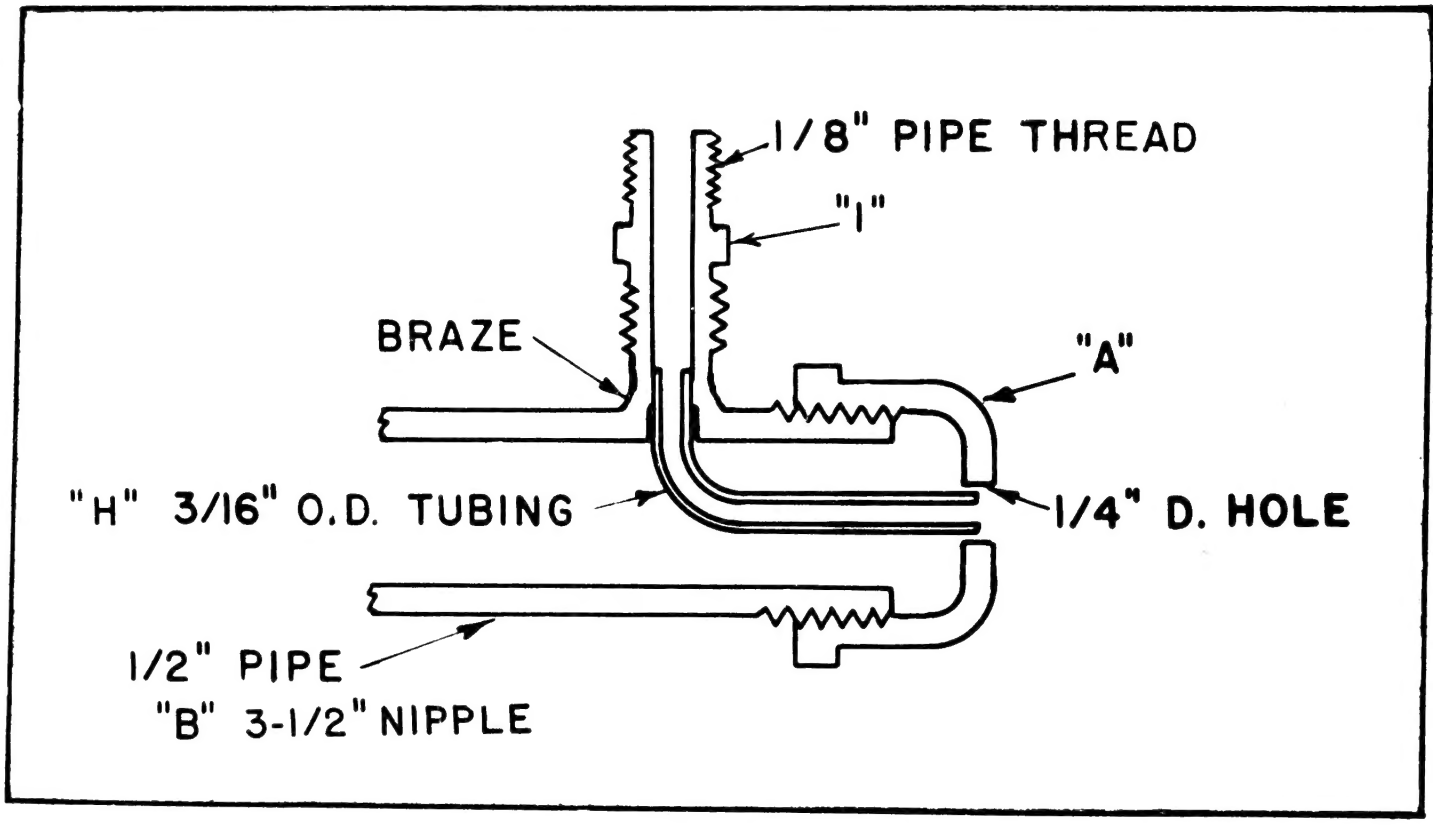

Figure 3.—Cross section through nozzle.